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THE PROLIFERATION OF SPECIALIST ORGANIZATIONS IN THE AMERICAN WINE INDUSTRY: 1941 - 1990

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ABSTRACT

Organizational populations often witness an increase in the number of organizations late in their history, typically as a result of the founding of specialist organizations that serve a narrow niche. This paper examines the relative importance of four processes -- density dependence in founding rates, niche formation through changes in consumer preferences, resource-partitioning, and direct institutional support -- in accounting for the level and dispersion in specialist organizational foundings. Analyses of the founding rate of specialist organizations, farm wineries, over 1941-1990 reveal that state-level farm winery density has the strongest impact on both the level and dispersion of farm winery foundings. Density effects are followed by the effects of resource-partitioning, institutional support, and niche formation in order of level importance and by the effects of niche formation, institutional support, and resource-partitioning in order of dispersion importance. The results suggest that explanations such as density dependence and resource-partitioning that are endogenous to a specific population need to be combined with explanations such as niche formation and changes in the institutional environment that are exogenous to the population to adequately account for the proliferation of specialist organizations in mature industries.

THE PROLIFERATION OF SPECIALIST ORGANIZATIONS IN THE AMERICAN WINE INDUSTRY: 1941-1990

Organizational populations as varied as newspapers, railroads, and banks apparently evolve in a strikingly similar pattern (Carroll, 1984: 88-89; Klepper and Graddy, 1990). The early history of these populations shows a small number of organizations. A period of rapid increase in numbers follows. Finally, the number of organizations either stabilizes or declines as the population matures. Several populations such as book publishing, music recording, newspaper publishing, brewing, and banking, however, show a dramatic resurgence in numbers after having experienced a protracted period of decline or stability (Powell, 1985; Carroll, 1987; Carroll and Swaminathan, 1991, Freeman and Lomi, 1994). Often these newly founded organizations constitute specialist organizational forms -- they depend upon a narrow range of environmental resources for survival (Freeman and Hannan, 1983; Carroll, 1985). Further, their formal structure, patterns of activity, and normative order are different from those of dominant generalist organizations. This pattern of industry evolution and new firm entry is also characteristic of the American wine industry, the context of this study. In this paper, I account for variations in the founding rate of specialist organizations in the American wine industry over the period, 1941-1990.

With few exceptions (Carroll and Swaminathan, 1992; Freeman and Lomi, 1994), the study of organizational foundings is rife with unitary causal explanations. For instance, founding rates of specialist organizations can be explained solely in terms of niche formation (Delacroix and Solt, 1988) or resource-partitioning (Carroll, 1985). Conceptually, it is important to determine which if any of several proposed theories contribute to an explanation of the founding rate of specialist organizations. Empirically, it is important to gauge the extent to which these theories explain the founding rate of specialist organizations. An understanding of how powerful the effect of a unit change in a given causal factor is on the dispersion of founding rates adds significantly to our knowledge of the organizational founding process (Singh and Lumsden, 1990). This study represents an initial attempt to estimate the relative influence of several causal processes that drive the founding of specialist organizations. These include density dependent legitimation and competition (Hannan, 1986), niche formation due to changes in the consumer preferences

(Delacroix and Solt, 1988), resource-partitioning (Carroll, 1985), and a supportive institutional environment (Tucker, Singh, and Meinhard, 1990).

In general, we would benefit from a disentangling of the various theoretical models that explain variations in organizational founding rates (Singh, 1993: 468-469). This issue has gained importance due to recent criticism of research on density-dependent evolution of organizational populations (Delacroix and Rao, 1994). In essence, Delacroix and Rao (1994) propose alternative interpretations of findings that support density dependence theory. With respect to organizational foundings, this study evaluates some of their arguments by modeling density dependence in founding rates in addition to alternative explanations such as the effects of infrastructural support and vicarious learning. More importantly, support for one or more of the above-mentioned theoretical explanations suggests a prominent role for different aspects of an organizational (sub)population's environment in the founding process. For instance, institutional support and niche formation are processes that are largely exogenous to an organizational population, whereas density dependence and resource-partitioning are processes that are endogenous to the organizational population.

Why study specialist organizations in particular? The study of specialist organizations is important for at least two reasons. First, specialist organizations may be responsible for "de-maturity" or a reversal in industry maturity (Abernathy, Clark, and Kantrow, 1983). Such reversal is often the result of changes in the relationship between technological and market preferences. Industry maturity is characterized by high levels of standardization in technology and products. Any reversal in industry maturity can be seen as an iterative process. The initial catalyst may be a change in the type of demand as buyers seek new and different product attributes. In response, producers may engage in process and product innovation. As these innovations become standardized practice, the stage is set for another occurrence of de-maturity. Thus a movement towards de-maturity broadly involves an increase in organizational diversity as organizations utilize specialized technology and introduce differentiated products to respond to environmental changes.

The second reason for focusing on specialist organizations follows from the observation that such organizations are typically small in size. Small organizations, in turn, have been credited with industrial renewal in advanced capitalist economies (Sengenberger, Loveman, and Piore, 1990). The growth of the small-firm sector is linked to a transition in the production system from one based on mass production to another based on flexible specialization (Piore and Sabel, 1984). Piore and Sabel (1984: 202-220) document trends towards specialization in several industries such as steel, chemicals, machine tools, textiles, computers, and home entertainment products. Market turbulence associated with higher entry and exit rates of small firms suggest that collectively, they act as change agents, especially in mature industries (Beesley and Hamilton, 1984). This view is supported by studies that show small firms accounting for a significant proportion of innovative activity in several industries (see for example, Acs and Audretsch, 1990: 45-58). Audretsch (1995: 36-38) finds that small firms (defined as those with fewer than 500 employees) have higher innovation rates in 14 of 18 two-digit SIC sectors. If small, specialist organizations are partly responsible for industrial innovation and renewal, it is important to develop an understanding of the conditions under which they proliferate.

The paper is organized as follows. First, I provide a brief account of trends in the post-Prohibition wine industry. Second, I review several theoretical explanations for the proliferation of specialist organizational forms. I derive testable hypotheses from each of these theoretical perspectives. Third, I provide an explanation of the data and the methods used in testing the hypotheses formulated earlier. Finally, after describing the analytical results, I discuss the findings of this study and provide some directions for further research.

SIGNIFICANT TRENDS IN THE AMERICAN WINE INDUSTRY: 1940-1990

Trends in the American wine industry in the post-Prohibition period suggest increasing industry consolidation, a common feature of mature industries. Figure 1 plots the number of firms or density and total sales volume in the American wine industry over 1940-90. At the beginning of the observation period in 1940, 1033 wineries were in operation.[2] This number declined almost continuously to a minimum of 330

in 1967. Despite the shrinking number of wineries, industry sales continued to rise. Most of these sales gains were achieved by large firms such as United Vintners, E&J Gallo and Guild Wineries at the expense of the smaller producers. This is reflected in high industry concentration. An indicator of concentration that is highly correlated with the 4-firm concentration ratio is the share of industry capacity held by the largest four firms. This ratio increased from 23 percent in 1940 to 52.4 percent in 1990 (Wines and Vines, Various Years). Observers of the wine industry attribute industry consolidation to two factors -- the operation of economies of scale and the acquisition of small and medium-sized wineries often by firms from outside the industry (Moulton, 1984). Thus, by the late sixties, the American wine industry seemed to have entered the mature phase of its life cycle. The industry's growth rate was slowing and it was dominated by a few, large mass producers whose products were more or less generic.

[Figure 1 about here]

The major market segments in the immediate post-Prohibition period were those for dessert and fortified wines. Changes in consumer preferences began to manifest themselves in altered patterns of wine consumption in the 1950s and 1960s. By 1968, table wine shipments exceeded dessert wine shipments. The sparkling wine segment also expanded from 0.7 percent to 5.7 percent of the domestic market over the period 1940-1990 (Wines and Vines Statistical Report, Various Years). Some of this increased demand for table and sparkling wines was likely met by existing mass production wineries that migrated to the new niche composed of these two product market segments (Delacroix, Swaminathan, and Solt, 1989). But a substantial portion of this demand was met through the proliferation of a specialist organizational form -- the farm winery.[3] Consequently, the number of wineries had rebounded to 1,327 by 1990.

Farm wineries typically manufacture premium, varietal wines, often from a designated vineyard, operating on a relatively small scale. These wineries have variously been called "boutique", "chateau" and "small" wineries. I follow Adams (1985: 537) in calling this specialist organizational form a "farm winery". Most definitions of boutique or chateau or farm wineries involve an indicator of size. Industry norms suggest that a farm winery is one that produces less than 50,000 cases of wine per year or has a storage capacity that is less than 100,000 gallons (Hiaring, 1976). These size-based definitions are also reflected in the farm

winery laws passed by several states to encourage the establishment of farm wineries. The earliest available data indicate 722 farm wineries in existence in 1940. This number declined almost continuously to a minimum of 141 in 1967. Early farm wineries typically produced undifferentiated products and their numbers likely declined due to increasing competition within the group and with the more efficient mass production wineries. Since 1969, a new wave of farm winery foundings has fueled the rapid growth in numbers of this organizational form. Figure 2 depicts trends in the founding of farm wineries over the period, 1941-1990.

[Figure 2 about here]

The initial spurt in farm winery foundings occurred in California, followed by Oregon and Washington. A few pioneering vintners took up winemaking as a hobby or in some cases, a second career. From 1967 onwards there was rapid growth in the number of California farm wineries. The number of California farm wineries increased from a minimum of sixty in 1967 to four hundred and ninety three in 1990. Outside California, the proliferation of farm wineries has been particularly impressive in the states of Washington and Oregon (Clark, 1989). By 1990 the number of wineries in Washington state had increased to eighty three -- of these seventy four were farm wineries. The number of farm wineries in Oregon increased from eight in 1961 to eighty three by 1990. Other states have also experienced phenomenal growth in the number of farm wineries, largely as a result of the passing of farm winery laws. One thousand and ninety nine farm wineries were in operation at the end of 1990, all except thirty having been founded over the period 1969-1990. The specialist strategy adopted by farm wineries is distinctive in that it involves the production of a wide variety of low-volume, high value-added products.

The specialist-generalist distinction in the American wine industry is reinforced both by institutional action on the part of regulatory authorities and collective action on the part of individual organizations. In addition to the distinctions explicit in state farm winery laws, the Federal Government made a distinction between farm wineries and mass production wineries in 1990 when it raised excise taxes on wine. Taxes on a 750-milliliter bottle of wine containing less than 14 percent alcohol by volume were raised from 3 cents to 25 cents. The first 100,000 gallons produced by a winery, however, were exempt from the tax hike. This

concession was in effect, a tax rebate for farm wineries. Mass production wineries were further disadvantaged due to an equally sharp increase in taxes on fortified wine (that contain 14 percent to 21 percent alcohol by volume) from 13 cents to 35 cents a bottle (Norris, 1990).

The Wine Institute, the original trade organization for the California industry, is viewed by some farm wineries as representing the interests of large mass producers (Berger, 1990). So in 1990, several farm wineries in California formed an independent trade organization called the Premium Winemakers of America (or PWA). The PWA also offered membership to non-California farm wineries which until then could not become members in the Wine Institute. Further signs of this industry-wide split were evident when nine farm wineries filed a lawsuit against the California Wine Commission (CWC), an organization created by state law to promote wine through research and market development (Brank, 1990).In the court-ordered referendum, members of the Wine Institute voted 125-111 to disband the CWC. The 125 wineries that voted against the Commission were mostly farm wineries (Graebner, 1990).

The formation of the Premium Winemakers of America, the dissolution of the California Wine Commission, and the growth of the premium varietal wine market signals the emergence of farm wineries as significant players in the wine industry (Fisher, 1990). In the next section, I develop hypotheses that attempt to explain the proliferation of this specialist organizational form.

THEORY AND HYPOTHESES

Density Dependence in Organizational Founding Rates

Hannan (1986) proposed a model that related the number of organizations (or density) to the founding rate within an organizational population. At low levels of density, each addition of an organization to the population facilitates the legitimation process and therefore increases founding rates. Legitimation of an organizational form implies that its use for a particular activity is widely accepted. That is, the organizational form acquires the status of a normative or a "taken-for-granted" solution to certain problems (Meyer and Scott, 1983). As density increases and approaches the environmental carrying capacity, competitive processes set in, the effect of density is reversed and it lowers the founding rate. Thus, this model predicts

that density dependence in organizational founding rates is nonmonotonic. Empirical support for this model has been found in several organizational populations (Hannan and Carroll, 1992; Singh, 1993).
At least three issues need to be addressed when applying the density model to organizational subpopulations (see also Singh, 1993). First, (sub)population boundaries are often defined by organizational form (Ranger-Moore, Banaszak-Holl, and Hannan,1991). Second, (sub)population boundaries are implicitly determined by the choice of a geographical level of analysis. Third, complex interdependencies can exist between organizational subpopulations (Barnett and Carroll, 1987; Barnett, 1993). Below, I address each of the above issues in relation to the density dependent proliferation of specialist organizations in the post-Prohibition American wine industry.

Form-specific Density Dependent Evolution

Previous research has shown support for form-specific density-dependence in the founding rates of subpopulations such as craft and industrial unions (Hannan and Freeman, 1989: 219-224; 290-293), stock and mutual life insurance companies (Ranger-Moore, Banaszak-Holl, and Hannan, 1991), and commercial and savings banks (Ranger-Moore, Banaszak-Holl, and Hannan,1991). In this study, I assume that the boundaries of specialist subpopulations are drawn around their organizational forms which are distinct from the mass production or generalist form that dominates the population. In doing so, I follow Hannan and Freeman (1989: 53-60) who suggest that researchers ought to focus on socially-constructed boundaries in defining organizational forms. Below, I describe farm wineries in terms of their organization, technology, and marketing strategy -- properties that can be used to classify them as a specialist organizational form (Hannan and Freeman, 1984).

Unlike organizations with generalist forms in the wine industry, specialists tend to remain small. Small size confers certain advantages upon specialists. Among others these include the ability to function with relatively simple internal organizational structures, quicker response to environmental changes, and an emphasis on the technical rather than administrative aspects of winemaking. Farm wineries often make wine from only one or two grape varieties. Farm winery owners and their families often supply most of the labor that is required for vineyard and winery operations. Conforming to high quality expectations is crucial

to the long-term success of farm wineries. Many farm wineries establish a second brand that is lower in quality and price to utilize wine grapes that do not meet quality standards established for the main brand. Farm wineries overcome resource constraints in the areas of production and distribution through cooperation with like organizations (Liebenson, 1986; Groves, 1991).

Most farm wineries do not possess the sophisticated technology, laboratories and production facilities that are common for mass production wineries. Instead of sophisticated technology, farm vintners assert the supremacy of vineyards, characteristic of the French doctrine of *gôut du terroir*, which literally stands for taste of the soil (Stuller and Martin, 1989: 37). In this view, only an appropriate match between climate, soil and grape variety can produce superior wine. Farm wineries often act in concert and petition the BATF for recognition of limited geographical areas as American Viticultural Areas (AVAs). This allows wineries within an AVA to distinguish their products by labeling their wines with the AVA as an appellation of origin. Finally, farm wineries that own vineyards can appeal to an even smaller niche by labeling their products as estate-bottled. The ability to estate-bottle wines is useful in a marketing sense because consumers often interpret the label as signifying a superior wine (Prial, 1992). Thus, the core technology used by farm wineries is widely available, but not used by generalist mass production wineries who are committed to large-scale production and who place a premium on the consistency of their generic products.

Perhaps the most striking difference between generalists and specialists in the wine industry lies in their contrasting approach to marketing strategy. Specialists tend to target small, upscale niches within their industries. Instead of mass media advertising, farm vintners rely primarily on word of mouth or as Alex Hargrave, a pioneer Long Island farm winery owner, puts it "the exponential dinner party", in which someone who has tasted a wine serves it at dinner to people who subsequently serve it to others (Wax, 1990). Farm wineries reach consumers mainly though their tasting rooms. Many use the winery as a marketing tool. Attractions such as receptions, weddings, renaissance fairs, harvest celebrations, picnicking areas and trout fishing generate extra cash for farm wineries, cash that is scarce during the initial 5-10 years it takes for vineyards to mature (Fox, 1987). Farm wineries also augment their sales through private labeling, especially for restaurants. Farm wineries are further dependent upon the whims and

fancies of wine critics. Wine critics are influential enough that winemakers often create wines that agree with the critics' palates (Unwin, 1991: 355).

An observed spurt in foundings of specialist organizations within an organizational population may reflect either the emergence of a new specialist organizational form or the rapid growth of an existing specialist organizational form. The latter case would seem to apply to the post-Prohibition American wine industry. 1,711 or roughly eighty two percent of the 2,073 wineries founded in the period 1941-1990 were farm wineries. Of these 1,711 farm wineries, as many as 1,409 were founded in or after 1969. Farm wineries, the specialist organizational form in the wine industry, should then be subject to independent processes of legitimation and competition based on form-specific counts of density. Therefore I expect to find support for the following proposition.

Proposition 1: The founding rate of farm wineries will first increase and then decline with increasing farm winery density.

Levels of Analysis in Density Dependent Evolution

The choice of an appropriate geographical level of analysis is also an important theoretical consideration in applying the density model to organizational subpopulations (Freeman, 1990: 64-65; Carroll and Wade, 1991; Baum and Mezias, 1993). Hannan and Carroll (1992: 208-209) suggest that the level of analysis chosen should encompass most of the competition occurring among similar organizations. In the wine industry, specialist organizational forms are responsive to local environments. The primary market for the products of these specialist organizations is geographically limited mainly because of a lack of access to strong distribution channels. Farm wineries rely extensively upon on-premise sales. Besides, several states have farm winery laws which accord preferential treatment to local farm wineries. Further, these specialist organizations use their localized presence to advantage by positioning their products as home-grown and thus appealing to the pride of local consumers. Therefore it would seem that the appropriate geographical boundary among these specialist organizational forms should be the state boundary. Proposition 1 can now be restated as the following hypothesis.

Hypothesis 1: The state-level founding rate of farm wineries will first increase and then decline with increasing state-level farm winery density.

Interdependence Within and Among Organizational Subpopulations

Specialist organizations may exhibit complex patterns of interdependence among themselves and with generalist organizations. Organizations with the same specialist form may be interdependent in a spatial sense if specialists outside the state boundary influence state-level founding rates of specialists in any way. The effect of specialists located outside state boundaries would depend to a large extent upon the relative strength of segregating and blending processes in the specialist subpopulation (Hannan and Freeman, 1989: 54). Segregating processes create and strengthen boundaries between organizational forms whereas blending processes erode and dissolve such boundaries. In the extreme case, if the specialist subpopulations are totally segregated at the state-level, then specialist organizations located outside state boundaries would have no effect whatsoever on the founding process. This may be the case when interaction, whether mutualistic or competitive, rarely extends beyond state boundaries. For specialist organizations based on existing organizational forms, however, we might witness interdependence across state boundaries. Farm wineries that are either large or premium producers increasingly have access to established distribution channels such as wholesalers in other states or use innovative methods such as mail order to compete aggressively with local producers. Such an argument suggests that out-of-state farm winery density will have a competitive effect on the state-level farm winery founding rates.

Alternatively it is possible that out-of-state farm wineries enhance the legitimation of farm wineries in a focal state and thus accelerate the founding rate. Such a result would be consistent with a recent study of the founding rate of automobile manufacturers in Belgium, Britain, France, Germany, and Italy (Hannan, Carroll, Dundon, and Torres, 1995). Hannan et al. (1995) find that European automobile manufacturer density has a positive effect on the founding rate of automobile manufacturing firms in the four countries other than Britain. Though the competitive effects of density are intuitive, the positive effect of initial increases in density on the organizational founding rate is subject to interpretations other than the social legitimation of the organizational form (Delacroix and Rao, 1994). In particular, the legitimating effects of out-of-state farm winery density on the founding rate of farm wineries in a focal state can also be interpreted

as a case of vicarious learning (Delacroix and Rao, 1994: 265). In fact, these processes may act in ways that reinforce each other. Farm wineries may also be subject to competition from in-state mass production wineries who compete through similar distribution channels. In this study, I treat interdependence within the farm winery subpopulation and between the farm winery and mass production winery subpopulations mainly as an empirical issue.

Niche Formation

Delacroix and Solt (1988: 54) argue that foundings in the California wine industry are driven by a niche formation process. In their view, the new niche in the wine industry evolved out of changes in lifestyle and associated consumer preferences (see also Eysberg, 1990: 88-90). A change in consumer preferences is one among several exogenous factors that may lead to the creation of a new niche. A new niche could also be formed as a result of technological discontinuities. For example, foundings in the semiconductor manufacturing industry seem to be driven by technological innovation (Brittain and Freeman, 1980). Tushman and Anderson (1986) account for product substitution through technological changes which destroy the competencies of incumbent firms. The emergence of new product classes such as cement (in 1872), airlines (in 1924), and plain-paper copying (in 1959) is attributed to basic technological innovations. Innovation in production technology, however, does not seem to be a major force behind the proliferation of specialist organizational forms in the wine industry.

Abernathy and Clark (1985: 18) suggest that three specific kinds of environmental changes might lead to the formation of a new niche. First, new technological options offer improved performance or new applications that cannot be met by existing product designs. Second, changes in government policy, especially in regulatory regimes may favor revolutionary strategic development. Finally, changes in consumer preferences may impose requirements that can be met only through new design approaches. Delacroix and Solt's (1988) niche formation argument thus has the same flavor as the process of "niche creation innovation" (Abernathy and Clark, 1985: 10-11) where organizations build on existing technical competence and apply it to emerging market segments. Given an underlying change in consumer

preferences, the influx of organizations with specialist forms is likely to be greater as the new market niche expands in volume.

Proposition 2: The greater the volume of the new niche, the higher the founding rate of specialist organizations that focus on that niche.

Delacroix and Solt (1988) use the level of wine imports as an indicator of the volume of a new niche comprising the table and sparkling wine segments. Most of these imports originated in continental European countries, where table and sparkling wines account for the bulk of wine consumption. Increases in the level of wine imports have a strong positive effect on foundings in the California wine industry. Delacroix and Solt (1988) interpret this as evidence that niche formation increases the founding rate. The identity of entrants into new niches in the wine industry, however, is unclear. Nevertheless, if one assumes that mass production wineries are likely to be subject to greater structural inertia (Hannan and Freeman, 1984; but see Haveman, 1994), the niche formation argument would suggest the following hypothesis

Hypothesis 2: The greater the volume of wine imports, the higher the founding rate of farm wineries.

Resource-Partitioning

Trends in organizational density are often related to trends in industrial concentration. As the number of organizations declines, the market share held by the largest few firms typically increases. Organizational populations usually experience two low density periods characterized by different degrees of concentration. The low density period occurring early in a population's history is accompanied by low concentration. In contrast, the low density period occurring late in a population's history features high concentration. Carroll (1985) developed a model of resource-partitioning to account for the mortality rates of specialist firms in environments characterized by varying degrees of market concentration.

The resource-partitioning model predicts that when the market concentrates, the death rate of generalist organizations will increase and that of specialist organizations will decrease. Underlying this pattern is the observation that in a concentrated market generalist and specialist firms seem to operate in distinct resource spaces whereas they rely on a common resource base in an unconcentrated market. With increasing concentration, generalists tend to compete vigorously for the center of the market, thus allowing

specialists to thrive in the periphery. Carroll (1985) found support for the resource-partitioning model in an analysis of mortality rates in seven local newspaper populations over 1800-1975 (see also Carroll and Swaminathan, 1992).

The resource-partitioning model can easily be extended to the founding process. High concentration in the market implies that specialists can draw upon peripheral resources without entering into direct competition with generalists. Increasing levels of market concentration frees more peripheral resources. Existing specialists may grow and survive longer by exploiting such resources. The increased availability of peripheral resources may also facilitate the founding of specialist organizations. Such a pattern would be consistent with the findings of Barnett and Carroll (1987). In a study of interdependence in the evolution of the early telephone industry, they showed that the greater the average size of incumbent telephone companies, the higher the founding rate of new telephone companies. More recently, Freeman and Lomi (1994) have applied the resource-partitioning model to explain the founding rate of rural cooperative banks in Italy over the period 1964-1988. In keeping with the predictions of the resource-partitioning model, they found that the size and market share of generalist national banks has a positive effect on the founding rate of specialist rural cooperative banks. Therefore

Hypothesis 3: The greater the level of market concentration in the wine industry, the higher the founding rate of farm wineries.

Institutional Support

Changes in the institutional environment may have profound effects on the founding of specialist organizations. Tucker, Singh and Meinhard (1990) studied the effect of one aspect of the institutional environment, changes in government policies, on the founding rates of voluntary social service organizations (VSSOs) in Canada. They found that the establishment of the "Opportunities for Youth" program between 1971 and 1975 legitimated and provided additional resources for VSSOs. Consequently, specialist VSSOs were founded at a much higher rate during this period.

The existence of a sympathetic institutional environment may also account for persistent differences in the evolution of the farm winery subpopulation in different states. As mentioned earlier,

several states have "farm winery laws" on their books. Pennsylvania pioneered such legislation in 1968. The number of farm wineries in Pennsylvania shot up to fifty two by 1990. All but one of these firms were founded after the passage of the farm winery law. Legislation has had similar effects on the wine industry in other states such as New York where the law was passed in 1976. Of the eighty New York state farm wineries operating for all or part of 1990, seventy six were founded in the period 1976-1990. Farm winery laws usually offer excise tax benefits and reduced licensing fees for operators of wineries below a certain size. Often, there is an additional stipulation that these farm wineries use a certain percentage of grapes grown within that state. In many states such legislation allows farm wineries to sell directly to consumers and to restaurants, a practice that is illegal for mass production wineries under the prevalent three-tier system of distribution (manufacturer to wholesaler to retailer). By 1990, twenty five states had adopted farm winery laws. The impact of such legislation is evident in the sudden increase in farm winery foundings in the 1970s and 1980s as shown earlier in figure 2. Of the 1,711 farm wineries founded in the period 1941-1990, as many as 1,409 were founded in or after 1969. In general, a supportive institutional environment may signify an underlying acceptance of locally based specialist organizations that produce alcoholic beverages.

Hypothesis 4: The existence of state farm winery laws will increase the founding rate of farm wineries in such states.

Direct institutional action such as the passage of farm winery laws may act as an independent source of legitimation for farm wineries. Institutional support and density-dependent legitimation both facilitate an organizational form's access to resources (Delacroix and Rao, 1994: 259). Collective action by small groups of organizations is often aimed at securing institutional support in the form of Government regulations that protect infant industries (Carroll, Delacroix,and Goodstein, 1988) or laws that structure industry competition in particular ways (Barnett and Carroll, 1993). If direct institutional support and density-dependent legitimation are independent processes, density-dependent legitimation is likely to be weaker in states that pass farm winery laws. That is, the interaction effect of density and the existence of a farm winery law on state-level farm winery founding rates should be negative. I explore such an interaction effect in the analysis of farm winery founding rates.

Environmental Carrying Capacity

Organizational founding rates are likely to be higher when the excess carrying capacity of the environment is greater (Brittain and Freeman, 1980; Pennings, 1982; Baum and Singh, 1994). The carrying capacity of the environment for farm wineries is likely to vary across states. Hypotheses 1 through 4 need to be tested with reference to a baseline model of organizational founding among farm wineries that incorporates state-level variations in carrying capacity. I model these state-level differences in terms of three variables -- the per capita personal income of a state's residents, the per capita wine consumption of a state's residents, and the percentage of a state's population that lives in dry areas. Consumer affluence is likely associated with the emergence of small upscale niches in the wine industry. Therefore states with higher per capita incomes are likely to experience a higher farm winery founding rate. On the other hand, states that have a large proportion of their populations living in dry areas likely reflect persistent social norms that discourage the sale and consumption of alcoholic beverages. These underlying attitudes may attain greater significance for farm wineries since these specialist organizations depend extensively on local patronage for survival and growth. In such states, farm winery foundings are likely to be lower.

Mass Dependence and Externalities

The founding rate of organizations with specialist forms may also be dependent on the mass (the sum of sizes of organizations) of the farm winery subpopulation. On the one hand, larger organizations may create positive reputational externalities for smaller organizations. This is supported by results that show that population mass increases the founding rate within an organizational population (Barnett and Amburgey, 1990; Delacroix and Rao, 1994: 262). On the other hand, larger organizations may create negative infrastructural externalities for other organizations by erecting entry barriers that reduce the organizational founding rate. According to this argument, population mass should lower the founding rate (Barnett and Amburgey, 1990: 82-84; Delacroix and Rao, 1994: 267).

I test hypotheses 1 through 4 using data collected on the American wine industry over 1941-90. I first estimate a baseline model that incorporates variations in the carrying capacity of the environment for farm wineries. I also test the sensitivity of the farm winery founding models to mass dependence in farm winery

founding rates. The next section discusses the primary sources of data, the measurement of key variables, and explains the models and methods used in the analyses.

RESEARCH DESIGN: DATA AND METHODS

Data Sources

Annual directories of wineries compiled by *Wines & Vines*, an industry trade publication, constitute the primary source of event-history data on the population of winemaking firms. Since the directories constitute a complete census of the American wine industry, the data includes information on all American wine producers.

The data entries in the *Wines & Vines* directories provide for each bonded premise (or production plant), data on the company name and address, bonded winery or wine cellar license number, current owners or managers, size in terms of storage capacity, vineyards owned, products and brand names. Because the listings in the annual directories relate to plants (individual bonded premises) rather than to firms, I aggregated the histories for all plants belonging to the same firm. That is, my data records firm-level event histories on foundings and deaths. The founding year is assumed to be the year in which a winemaking firm first appears in the directory. Since the directories are available from 1940 onwards, I can accurately identify founding years for wineries founded during 1941-1990, the period covered by this study. Data on winery foundings, dissolutions, and acquisitions have been corroborated by examining industry news columns in monthly issues of *Wines & Vines* over the entire period of observation. The event-history data have been further cross-validated by examining annual records provided by the Bureau of Alcohol, Tobacco, and Firearms. Hannan and Carroll (1992: 163-167) argue that left truncated data of the kind used in this study will likely lead to a lack of support for density dependence in organizational founding and mortality rates. Other studies using left-truncated data, however, have shown support for density dependence in founding rates (Baum and Singh, 1994; Lomi, 1995). Thus discrepant findings with respect to density dependence in founding rates cannot be attributed solely to the use of left-truncated data (Singh, 1993: 469-470).

Industry data were obtained from the *Wines & Vines Annual Statistical Survey* (Wines and Vines, Various Years) and *Jobson's Wine Marketing Handbook* (Jobson's Publishing Corp., Various Years). Firm-level data have been obtained from the *Wines & Vines Yearbook of the Wine Industry* (Wines & Vines, Various Years), *Wine & Vines Wineries of North America and Vineyard Industry Suppliers* (Wines & Vines, Various Years), *Wines & Vines Directory of the Wine Industry* (Wines & Vines, Various Years), and *The New Connoisseur's Handbook of California Wine* (Roby and Olken, 1991) .

Measurement of Variables

Dependent Variable

Organizational Foundings: From the event-history data, I was able to construct this variable by aggregating the number of wineries founded at any time in a given year in each state. The time series of annual number of foundings was further subdivided by organizational form to obtain separate series for farm wineries and mass production wineries.

Independent Variables

Organizational Density: Following Hannan and Freeman (1989), I operationalized density as the number of wineries ever to operate in a particular state in a given year regardless of how long. This total count was further broken up by organizational form to obtain measures of mass production winery and farm winery densities. Form-specific density measures for wineries within and outside each state were calculated from the event-history data described earlier. These data were available for the period, 1940-1990.

Industry Concentration: A measure of industry concentration in terms of the 4-firm concentration ratio, that is, the share of the total market accounted for by the cumulative sales of the largest four firms in a given year was available only for the period 1963-1990. Data on firm-level sales were available in *Jobson's Wine Marketing Handbook* (Jobson Publishing Corp., Various Years), the *Impact American Wine Market Review and Forecast* (Tasco Publishing Corp., Various Years), and periodically in the *Census of Manufactures.* To extend the coverage of data on industry concentration, I used a different measure which is the share of industry storage capacity accounted for by the largest four firms. For the period, 1963-1990,

the concentration measure based on sales averaged 50.2 percent whereas the concentration measure based on capacity averaged 47.3 percent. The two measures of industry concentration were highly correlated (Pearson correlation coefficient=.99, p=.001). Given the similarity of the two measures, I used the concentration measure based on capacity since it is available over the entire period of observation. Data on industry concentration were available for the period, 1940-1990.

Niche Formation: The niche creation process was captured by the volume of wine imports. Data on the volume of wine imports were taken from *Wines & Vines Annual Statistical Reports* (Wines & Vines, Various Years). Data on the volume of wine imports were available for the period, 1934-1990. This variable was measured in millions of gallons.

Direct Institutional Support: Information on farm winery laws has been obtained from the description of state laws and regulations in the annual directories of *Wines & Vines* (Wines & Vines, Various Years), from Adams (1985, 1990), and in some cases by contacting state alcoholic beverage control agencies.

Environmental Carrying Capacity: The carrying capacity of the environment for farm wineries was captured by three variables. First, data on real per capita personal income in each state have been collected from statistics compiled by the Bureau of Economic Analysis, U.S. Department of Commerce (1994). This variable was measured in thousands of constant 1982 dollars. Data on real per capita personal income were available for the period, 1940-1990 for all states except for Alaska over 1940-1949. Second, state-level data on the percentage of population living in dry areas were extracted from the *Brewers Almanac* (U.S. Brewers Association, Various Years). These data were available for each state from 1938-1990. Third, state-level data on annual per capita wine consumption were calculated from the *Wines & Vines Annual Statistical Surveys* (Wines & Vines, Various Years). Per capita annual wine consumption was measured in gallons. These data were available for each state from 1940-1990 except for Alaska over 1940-1952 and for Hawaii over 1940-1952. The missing data on per capita wine consumption resulted in a loss of 26 state-years in the time series of event counts for farm winery foundings. Consequently, I was able to use only 2,524 state-years of the 2,550 state-years (50 years X 51 states including the District of Columbia) that are available for analysis in the period 1941-1990.

Population Mass: Population mass for specialist organizational forms was measured in terms of the total storage capacity of farm wineries in a given year (see Barnett and Amburgey, 1990). These data were collected from the annual directories of *Wines and Vines* (Wines & Vines, Various Years) and were available for the period, 1940-1990.

Descriptive Statistics

Table 1 provides descriptive statistics on the variables used in the founding rate analysis. Farm wineries were assumed to be at risk of being founded after Repeal in 1933. Since several variables were only available from 1940 onwards and all independent variables were lagged by one year to ensure exogeneity with respect to the dependent variable in question, I was able to analyze farm winery founding rates only for the years, 1941-1990. A total of 1,711 farm wineries were founded during the period, 1941-1990. The data for the analysis of founding rates were organized in the form of an annual time-series from 1941-1990 for all variables.

[Table 1 about here]

Methods

In the following analysis, I tried to identify factors that influence the proliferation of the farm winery organizational form in the wine industry in post-Prohibition America. I used event count models to model the state-level founding rate of farm wineries, . Though farm wineries were theoretically at risk of emerging since the repeal of Prohibition in 1933, data availability restricted the period of analysis to 1941-1990.

In modeling the organizational founding process, I followed convention in defining the population as the unit of analysis and treated foundings as events in a point process (Cox and Isham, 1980; Amburgey, 1986). Because the dates of founding often record only the year of founding, I did not know the ordering of events within years. Nor did I know the exact duration between foundings. In doing work of this kind, organizational ecologists have typically assumed a constant rate of founding with log-linear dependence on covariates (Hannan and Freeman, 1989). This approach assumes that, conditional on the values of the covariates, a time series of annual counts of foundings is the realization of a Poisson process. This implies that the number of foundings in year t, Y_t, is determined the probability law:

$$Pr(Y_t = y_t) = \exp(-\lambda_t)\, \lambda_t^{y_t} / y_t! \,. \quad (1)$$

The relationship between the founding rate, λ_t, and the vector of covariates, X_t, is specified as follows:

$$\ln \lambda_t = \alpha + \beta X_t \quad (2)$$

Assuming that a series of counts of foundings is a realization of a Poisson process implies, however, that the occurrence of a founding is independent of previous foundings. It also implies that the expected number of foundings in a year equals the variance of the number of foundings in that year. Both of these assumptions are questionable in cases where the variance of event counts exceeds the mean, a condition called "over-dispersion". Adopting the Poisson model in the presence of overdispersion can lead to misleadingly small standard errors for the estimated coefficients. Overdispersion can result either from unobserved heterogeneity in founding rates or from positive contagion. The Poisson model shown in equation (2) does not have an error term thus allowing no role for either random error or unobserved causal variables (Hausman, Hall and Griliches, 1984). In the presence of unobserved heterogeneity across observations, the variance of the observed counts will exceed the variance estimated by Poisson regression. Further, some studies of organizational founding (Delacroix and Carroll, 1983; Delacroix and Solt, 1988) find positive contagion in the founding process implying that the count of foundings in one year increases the rate of subsequent foundings. More generally, contagion effects may also operate within a given year. In practice, it is often impossible to isolate a specific source of overdispersion. One solution to the problem of overdispersion is to use the negative binomial model which overcomes the limitations of the Poisson model through the inclusion of an overdispersion parameter (Barron, 1992). This model has been used both in research on political events (King, 1989) and organizational foundings (Ranger-Moore, Banaszak-Holl, and Hannan, 1991; Carroll and Swaminathan, 1991; Baum and Singh, 1994). The relationship between the founding rate, λ_t, and the vector of covariates, X_t, is specified as:

$$\ln \lambda_t = \alpha + \beta X_t + \epsilon_t, \quad (3)$$

where ϵ_t has a gamma distribution.[4] One can choose other probability distributions to describe ϵ_t (Johnson, Kotz, and Kemp, 1992: 203-207). The gamma distribution is often chosen in practice because of computational ease and its ability to accommodate a wide variety of underlying shapes for the distribution of event counts (Barron, 1992: 189). The analyses reported in this paper used the quadratic specification of

the negative binomial model (McCullagh and Nelder, 1989).[5] According to this specification, the variance increases linearly with the expected count. The model has an additional over-dispersion parameter, θ, where

$$Var(Y_t) = E(Y_t)\,(1 + \theta E[Y_t]). \tag{4}$$

Setting $\theta = 0$ in (4) simplifies the negative binomial model to a Poisson model. Thus one can form likelihood ratio tests of the Poisson process versus the negative binomial. The likelihood ratio test statistic is defined as

$$\mu = \max L_0 / \max L_1, \tag{5}$$

where L_0 and L_1 denote the likelihoods of the null model (subject to, say, n constraints) and the alternative model that relaxes the constraints respectively. With large samples, $-2\ln \mu$ is distributed as a Chi-square with n degrees of freedom. I report the negative of the log likelihood for the founding models in my tables. Therefore, two times the difference of the negative log likelihoods of a pair of hierarchically nested models in the tables has approximately a Chi-square distribution under the null hypothesis. I report the change in the log-likelihood Chi-square ratio for all models relative to a baseline model of farm winery founding. I use maximum likelihood methods available in the statistical package LIMDEP, Version 6.0 (Greene, 1991) to estimate negative binomial founding rate models.

Negative binomial regression models allow us to estimate the effect of a particular independent variable on the farm winery founding rate, holding other variables constant. The effect of any variable on the founding rate is depicted in terms of a multiplier of the unobserved founding rate. This multiplier is obtained by exponentiating the product of the estimated coefficient of any variable over the range of values for that particular variable. The multiplier for a variable X is given by the following formula:

$$\text{Multiplier} = \exp(\beta X_i) / \exp(\beta X_{min}), \tag{6}$$

where β is the coefficient estimate for the independent variable, X_i is the value of that variable, and X_{min} is the minimum value of that variable. For some processes, such as direct institutional support captured by the existence of a farm winery law in a given state (a 0,1 variable), the multiplier equals $\exp(\beta)$. The concept of a multiplier is similar to that of level importance of an independent variable in a particular sample

-- the multiplier indicates the degree to which an independent variable will influence the level of the dependent variable (Achen, 1982: 71-73).

An evaluation of the relative impact of different variables on variations in the founding rate of farm wineries requires the use of a standardized unit of measure. Therefore, I converted all values of all variables to their standard normal equivalent. Since the farm winery founding counts are distributed negative binomial, I use a transformation of the dependent variable to approximate a standard normal distribution (Johnson, Kotz, and Kemp, 1992: 212). The transformed dependent variable Y_{1t} is calculated as:

$$Y_{1t} = (k)^{½} \sinh^{-1} (Y_t / k)^{½}, \quad (7)$$

where Y_t is the observed series of founding counts, k is equal to θ^{-1}, and Y_{1t} is the transformed series of founding counts. I used values of k obtained from the negative binomial regression models.

Standardized betas, the estimates from OLS regression models using the standardized data can be used to compare the causal importance of different independent variables.[6] Standardized OLS regression estimates show the number of standard deviations that the farm winery count will change when a particular independent variable changes by one standard deviation. In that sense, standardized betas are a measure of the dispersion importance of an independent variable, its impact on the spread of farm winery founding counts over 1941-1990 (Achen, 1982: 73-77).

RESULTS

Table 2 presents negative binomial regression models of farm winery foundings over the period 1941-1990. Model (1) presents the baseline effects of variables that measure the carrying capacity of the environment. Farm winery founding rates are higher in states with higher per capita income and wine consumption. These baseline effects lose statistical significance in the more fully specified models (3) through (6). Hypothesis 4 is supported by model (2) -- the farm winery founding rate is higher in states that have implemented farm winery laws. Model (3) tests hypotheses 1 through 4 simultaneously. All of the hypotheses are supported. State-level farm winery density has a significant nonmonotonic effect on the founding rate of farm wineries, thereby supporting hypothesis 1. This result is consistent with the

predictions of Hannan's (1986) model of density dependent evolution. Farm wineries do not show any interdependence with either farm or mass production wineries located outside a focal state. Vicarious learning in the founding process seems localized both in terms of organizational form and geography. State mass production winery density, however, exerts a negative effect on the state-level farm winery founding rate, suggesting competition between these two organizational forms in local output markets. The indicator of niche formation, volume of imports, has a significant positive effect on the founding rate in model (3). This result supports hypothesis 2. In model (3), the resource-partitioning variable, industry concentration, has a positive and significant effect on the founding rate as predicted by hypothesis 3.[7] Hypothesis 4 is again supported in model (3). Direct institutional support in the form of a farm winery law is associated with a higher farm winery founding rate.

[Table 2 about here]

The exclusion of the out-of-state density variables in model (4) results in a parsimonious model where the effects of density dependence, niche formation, resource partitioning, and direct institutional support on the farm winery founding rate remain strong and as predicted by hypotheses 1 through 4. Model (5) examines whether increasing density and direct institutional support are independent sources of legitimation of the farm winery organizational form. Recall that support for such an argument requires that the interaction of farm winery density and the existence of a state farm winery law should exert a negative effect on the farm winery founding rate. Model (4) shows that even though the interaction effect is negative, it is not statistically significant. Model (6) tests the sensitivity of model (5) to the inclusion of the population mass variable. In this model, mass does not affect the farm winery founding rate significantly. I still find support for hypotheses (1) through (4) in this final model of table 2.

Let us evaluate the level importance of the various processes in explaining the proliferation of farm wineries (Achen, 1982: 71-73). The level importance of any variable is depicted in terms of a multiplier of the unobserved founding rate. Table 3 provides multiplier effects calculated using coefficient estimates from model (4), the one with the most explanatory power in table 2. The multiplier effects of density

dependence, niche formation and resource-partitioning are calculated at the mean values of the independent variables.

[Table 3 about here]

Increases or decreases in the founding rate can be calculated as the multiplier minus one. For example, the multiplier for the direct effect of the existence of a state farm winery law is 1.709, which implies that the passage of such a law increases the founding rate of farm wineries by an average of 70.9 percent. The effects of niche formation and resource-partitioning calculated at their mean levels is also quite strong -- they account for increases of 32.8 percent and 79.5 percent in the founding rate respectively. Since the range of farm winery density varies widely from state to state, its effects are best estimated for individual states (see Appendix 1 for founding rate multiplier effects for farm winery density by state). The average value of $Multiplier_{mean}$ for farm winery density in all states is 3.346, the strongest observed effect on farm winery founding levels.

Founding rate multipliers measure the level importance or the influence of independent variables on farm winery founding levels. But which of the four processes explains most of the variance in state-level farm winery founding counts? Standardized OLS regression models of farm winery founding counts address this question in table 4.[8] Models (7) through (12) in table 4 correspond exactly to models (1) through (6) in table 2 with respect to the independent variables that are included in each set of models. State farm winery density, wine imports, industry concentration, and the existence of farm winery laws all affect the dispersion of farm winery foundings in ways that support hypotheses 1 through 4 . Regression coefficients in table 4 can be interpreted as the number of standard deviations that farm winery founding counts will change when an independent variable changes by one standard deviation. I use the coefficients in model (10) to examine the relative importance of the four causal processes in the dispersion of farm winery foundings. Model (10) is analogous to the best-fitting model (4) of table 2. An examination of the magnitude of coefficients in model (10) suggests that state farm winery density has the greatest impact on the dispersion of farm winery foundings. The existence of farm winery laws has the next biggest effect on the dispersion of farm winery foundings, followed by the effects of niche formation and resource-partitioning. The interaction effects of

density and institutional support in models (11) and (12) are inconsistent with those found earlier in the negative binomial models (5) and (6). The interaction effect is positive in models (11) and (12) while it did not affect the founding rate significantly in models (5) and (6). An examination of the coefficients for state farm winery density in models (11) and (12) suggest that density effects have not weakened appreciably. Instead, the direct effect of farm winery laws on the dispersion of farm winery foundings falls off considerably in these two models. This pattern suggests that the effect of direct institutional support is stronger in states with higher farm winery density. One interpretation may be that farm wineries directly influence their institutional environment through collective action. The results of such organizing efforts are likely to be more fruitful in states with large numbers of farm wineries. The inconsistent findings across the negative binomial and standardized OLS regression models, however, suggest that this interpretation should be treated with great caution.

DISCUSSION

In this study, I examined several possible explanations that could singly or in some combination account for the proliferation of specialist organizations in an existing organizational population. These include density dependence in founding rates, niche formation through changes in consumer preferences, resource-partitioning, and direct institutional support. The analysis of founding rates of farm wineries over a fifty-year period commencing shortly after the end of Prohibition suggests that all four processes influence the proliferation of farm wineries, specialist organizations in the American wine industry. The effect of form-specific density on the founding rate of farm wineries is consistent with the pattern predicted by Hannan's (1986) model. Organizational founding rates first rise and then fall with increasing levels of form-specific density. Farm winery foundings are lower in states with higher numbers of mass production wineries, suggesting competition between these two forms at the local level. The niche formation argument receives strong support. The creation of a new niche around the consumption of import-like varietal wines has a positive effect on the founding rate of farm wineries. Resource-partitioning seems to affect the founding rate of farm wineries positively. Increasing concentration in the generalist mass-producer segment increases the founding rate of specialist organizations such as farm wineries. States that offer a supportive

institutional environment experience higher farm winery founding rates. These local factors seem to be more important in determining state-level founding rates of farm wineries -- external stimuli such as an increase in farm winery population mass, out-of-state farm winery density, or out-of-state mass production winery density show little impact in comparison.

I also examined the relative importance of the four causal processes on both the level and dispersion of farm winery foundings. Founding rate multipliers suggest that on the average, density dependence has the strongest effect on the level of farm winery foundings followed by resource-partitioning, institutional support and niche formation. These results are striking in view of Delacroix and Solt's (1988) analysis that proposed niche formation as the primary driver of California winery foundings. Standardized OLS regression results show that density dependence explains most of the dispersion in farm winery foundings. The effects of density are followed by that of niche formation, institutional support, and resource-partitioning in order of dispersion importance.

This study contributes to our understanding of industry evolution in two ways. First, it attempts to estimate the relative influence of various ecological processes that have been found to affect organizational founding rates. I find for example that though organizational density has the strongest effect on the founding rate of specialist organizations such as farm wineries, the effects of niche formation, resource-partitioning, and the institutional environment are substantial. The effects of niche formation and the institutional environment suggest that the proliferation of specialist organizations is not driven purely by processes such as density dependence and resource-partitioning that are endogenous to the population. Both niche formation and changes in the institutional environment are likely to affect the carrying capacity of an organizational population. The powerful impact of these two processes on the proliferation of specialist organizations in the American wine industry highlights the importance of identifying factors exogenous to an organizational population that affect the carrying capacity for that population.

Second, the study contributes to previous research on small firm entry that does not distinguish adequately between different kinds of entrants. Such studies often use highly aggregated industry-level panel data over short periods of time and rely on cross-sectional regression methods to model the effects of industry

characteristics such as entry barriers that reflect sunk costs, industry growth and profitability, and technological innovation on entry rates (Geroski and Schwalbach, 1991). Though some studies distinguish entrants to the extent that they reflect new plants or branch expansions by incumbent firms or diversifying firms, the bulk of this research focuses on net entry, the change in the number of firms in an industry over a given period (Dunne, Roberts, and Samuelson, 1988). These studies are likely to underestimate actual entry since the data exclude firms that were founded during the period of study, but failed to survive until the end of the observation period. More recent research corrects for these deficiencies by measuring gross entry, the total number of entrants into a given industry and distinguishing different types of entrants by size measured in terms of total employment (see for example, Acs and Audretsch, 1989). Despite the superior quality of Acs and Audretsch's data, the analysis of entry rates reduces what is clearly a dynamic process into a static one -- the entry rate is modeled as a function of covariates measured at the beginning of (or averaged over) the observation period. Moreover, the definition of small firms in terms of number of employees does not take into account interindustry variation along this dimension. Within this stream of research in industrial organization economics, there is increasing recognition of the need to study industry entry as a dynamic process that operates over long periods of time, a process that involves heterogeneity in entrant firms (Mueller, 1991: 15).

Though this study suffers from the limitations inherent in an industry case study, by focusing on the entry of specialist organizations over a fifty-year period in a specific industry, it advances our comprehension of small firm entry into industries. In particular, organizational form is likely a better indicator of heterogeneity among industry entrants than is the employment level of an organization. A variant of this research strategy would be to treat specialism as a continuous variable based on organizational niche characteristics, and to model the entry of firms as a function of organizational niche overlap (Baum and Singh, 1994). The research reported here can be extended in at least three different directions. These include establishing the generality of niche formation in mature organizational populations, examining whether resource-partitioning is a cyclical process, and investigating the plausibility of asymmetric effects of the selection environment on founding and mortality processes. I sketch each of these promising research directions in sequence.

The evolution of specialist organizational forms in the wine industry exhibits remarkable similarity to the later evolution of specialist forms in the brewing industry. In particular, the niche formation process appears to be instrumental in the proliferation of both farm wineries in the wine industry and microbreweries and brewpubs in the brewing industry. In the wine industry, higher levels of wine imports, an indicator of niche formation, are associated with a higher founding rate. Research on the effects of niche formation in other mature organizational populations would help in establishing the pervasiveness of this phenomenon.

Punctuated models of industry evolution suggest that resource-partitioning is a continuous cyclical process. High levels of industry concentration in mature industries often reflect the success of dominant mass production firms at producing low-cost standardized products. But in direct opposition to this very trend toward standardization, emerges another trend towards differentiation. There is some evidence in support of such a cyclical process. Kamien and Schwartz (1982: 70-75) review studies which, taken together, suggest that technological innovation and market structure influence each other in an iterative process. More recently, Anderson and Tushman (1990) propose a cyclical model of technological change where the emergence of a dominant design sets the stage for an era of incremental change abruptly followed by the next technological discontinuity. In examining the sources of dominant designs in four industries -- cement, container glass, flat glass, and minicomputers -- they find that on the average new entrants are more likely to introduce designs that destroy the technological competence of incumbent firms. While Anderson and Tushman (1990) focus on technological evolution, this study addresses the evolution of market niches within an industry and the organizational forms that occupy these niches. In this study, the emergence of a dominant organizational form sets the stage for a discontinuity in product markets, a discontinuity that is often introduced through the entry of organizations with specialist forms.

A relatively recent trend in the wine industry is the proliferation of microwineries, a new specialist organizational form that is much smaller in size than the farm winery (Fisher, 1993). Microwineries produce less than 2,000 cases a year. In comparison, farm wineries can produce as many as 40,000 cases a year. My data indicate that of the 1,099 farm wineries alive at the end of 1990, 330 were microwineries. All but four of these microwineries have been founded after 1970. A thorough examination of a cyclical model of

the resource-partitioning would require data on market concentration in the farm winery segment of the industry and a time series of microwinery founding counts that is long enough to allow for statistical analysis. I plan to continue collecting such data so that I can examine this proposition in the future.

Though the conclusions drawn here are based on findings from the wine industry, they are broadly generalizable to the proliferation of specialist organizations in mature industries that are characterized by high degrees of concentration. Similar structural conditions exist in industries such as newspapers, book publishing, music recording, retailing, life insurance agencies, computer application software, advertising, and managerial consulting. In fact, since the resource-partitioning process is likely to have occurred at an earlier time in some of these organizational populations, they might provide added insight, particularly into the prevalence of a cyclical process of resource-partitioning within the industry.

Finally. a complete treatment of the evolution of specialist organizations in mature industries requires analyses of both founding and mortality processes. Some empirical evidence suggests that environmental selection may affect the founding and mortality processes asymmetrically. For example, a thorough examination of density dependence in the evolution of the American brewing industry revealed that the founding process is largely influenced by local (in-state) density whereas the mortality process is affected to greater extent by non-local (out-of-state) density (Carroll and Wade, 1991). In general, it would be instructive to gauge the effect and the relative importance of ecological mechanisms such as those modeled in this study on both founding and mortality processes.

FOOTNOTES

1. The research reported here was supported by the University of Michigan Business School. I thank Glenn Carroll, Mike Hout and Trond Petersen for their advice on my dissertation research. Comments on earlier versions of this paper by Bill Barnett, Joel Baum, Jacques Delacroix, Jane Dutton, Heather Haveman, Will Mitchell, Christine Oliver and three anonymous reviewers were invaluable. Please address all correspondence to Anand Swaminathan, University of Michigan Business School, Ann Arbor, MI 48109-1234.

2. By wineries, I refer to winemaking firms. Even in 1940 there were 45 winemaking firms with more than one production plant. The analysis in this study is performed at the level of the winemaking firm and not at that of the individual production plant.

3. Of the 1,711 farm wineries founded between 1941 and 1990, data on product portfolios are available for 1,493 farm wineries. Of these, all but 89 produced either table or sparkling wine.

4. Lomi (1995) does not find support for the negative binomial model based on a Poisson process with gamma mixing and uses a semiparametric random-effects Poisson model instead. Since I found strong evidence of overdispersion using the gamma distribution to describe ϵ_t, I did not adopt Lomi's (1995) approach.

5. In the simpler linear specification of the negative binomial model, the variance is a constant multiple of the expected count, that is, $Var(Y_t) = E(Y_t)\ (1 + \theta)$. This specification can be estimated using King's (1990) program COUNT. Preliminary analysis indicated that the quadratic specification provided a superior fit to the farm winery founding counts.

6. Hanushek and Jackson (1977: 78-79) show that standardized regression coefficient estimates are sensitive to characteristics of the sample analyzed (see also Achen, 1982: 76-77). Since I used data not on a sample, but on the entire farm winery population in the founding analysis, the estimates are unlikely to be biased. However, the utility of standardized regression coefficients in comparing results across organizational populations is questionable.

7. In models not shown here, industry concentration had a negative effect on the founding rate of generalist (mass production) wineries, a result that is consistent with the resource-partitioning model.

8. I am indebted to a reviewer for suggesting this supplementary analysis.

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FIGURE 1

DENSITY AND SALES IN THE U.S. WINE INDUSTRY: 1940-1990

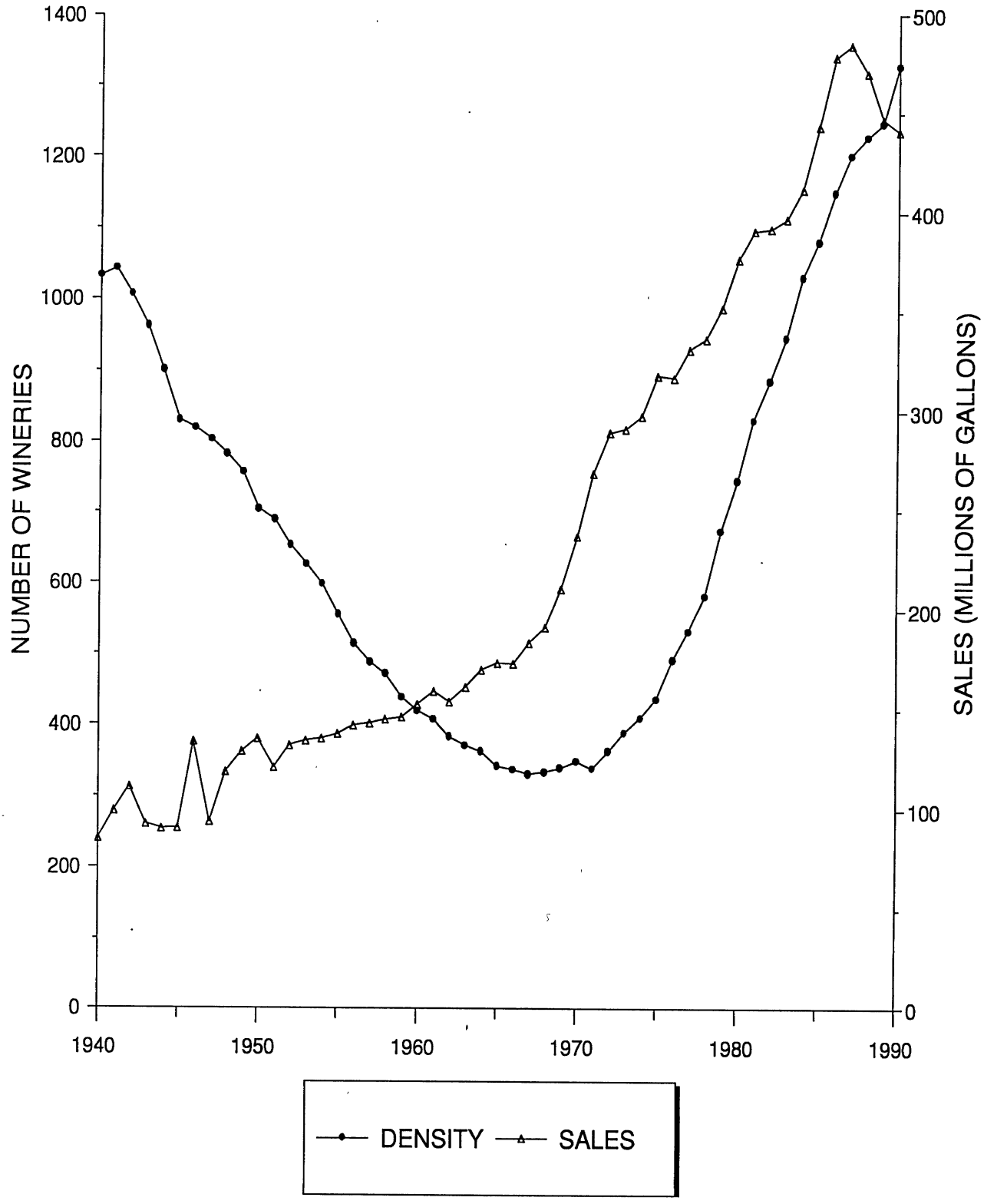

FIGURE 2

FOUNDINGS OF U.S. FARM WINERIES: 1941-1990

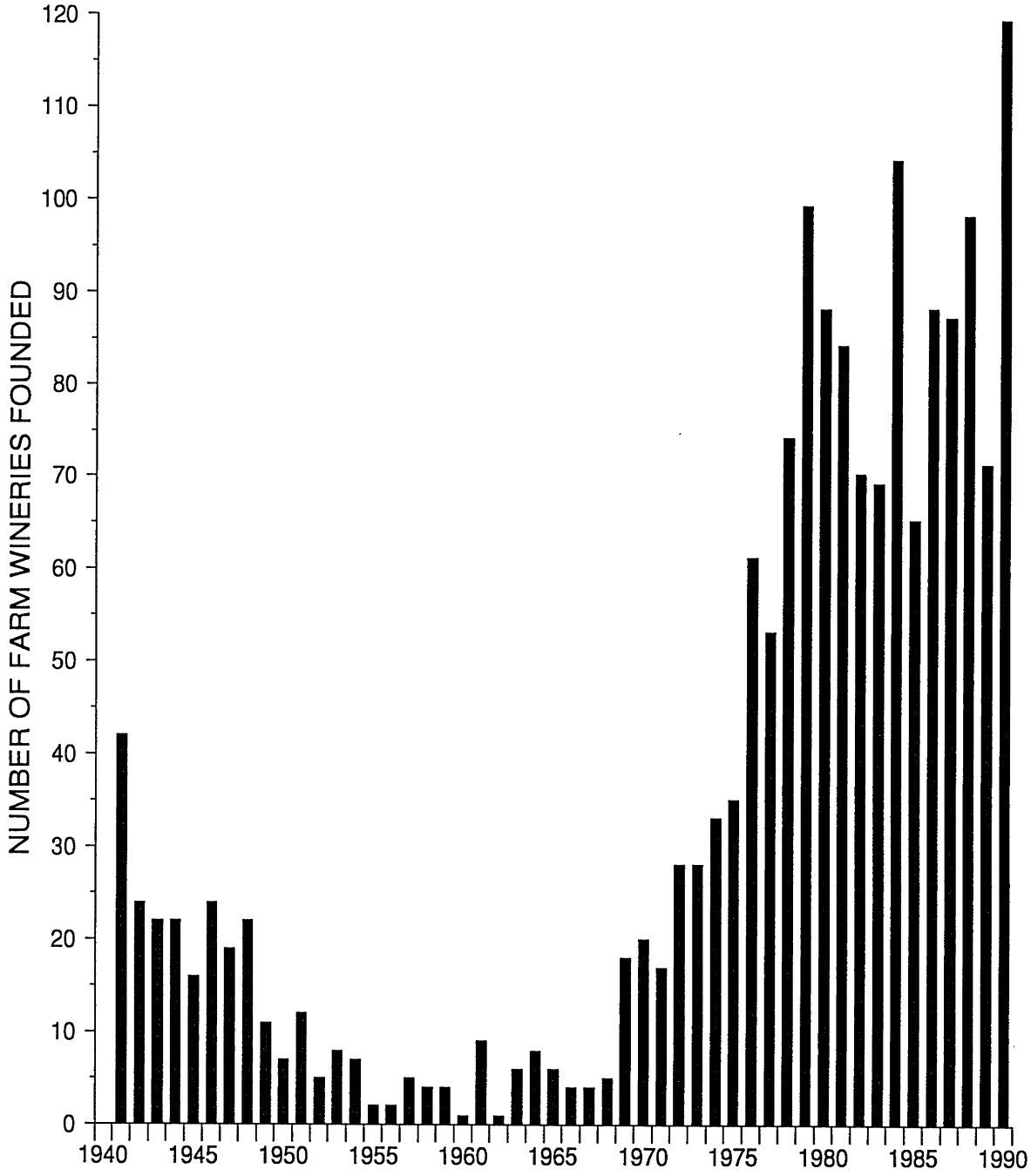

Table 1

Descriptive Statistics used in the Analysis of Farm Winery Founding Rates[a]

Variable	Mean	Std. Dev.	Minimum	Maximum
Number of Farm Winery Foundings by State	0.678	3.157	0	58
State Farm Winery Density	8.43	32.71	0	484
Out-of-State Farm Winery Density	416.58	263.48	81	1051
National Farm Winery Density	425.01	266.76	141	1051
State Mass Production Winery Density	4.711	22.271	0	206
Out-of-State Mass Production Winery Density	232.28	58.057	52	330
National Mass Production Winery Density	236.99	54.799	175	330
Industry Concentration (4-firm ratio)	38.711	10.011	22.04	52.35
Volume of Wine Imports (millions of gallons)	40.911	42.957	1.003	142.4
State Per Capita Annual Personal Income (thousands of constant 1982 dollars)	9.777	3.63	1.767	22.46
% of State Population living in Dry Areas	6.131	12.533	0	63.11
State Per Capita Annual Wine Consumption (gallons)	1.146	0.988	0	7.033
Farm Winery Law in State (1=Yes; 0-No)	0.103	0.305	0	1
Farm Winery Capacity (millions of gallons)	9.487	6.538	3.346	28.41

[a] N=2524 for all variables.

Table 2

Negative Binomial Regression Models of Farm Winery Foundings: 1941-1990[a]

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-2.6412*** (.1426)	-2.2785*** (.159)	-4.7617*** (1.621)	-3.9332*** (.2559)	-4.0247*** (.2605)	-4.0191*** (.2624)
State Per Capita Annual Personal Income (thousands of constant 1982 dollars)	0.0840*** (.0189)	0.0179 (.0227)	0.0203 (.0366)	0.0295 (.0333)	0.0373 (.0338)	0.0389 (.0367)
State Per Capita Annual Wine Consumption (gallons)	0.7126*** (.0727)	0.8570*** (.0749)	0.0234 (.0777)	0.0174 (.0760)	0.0036 (.0766)	0.0026 (.0780)
% of State Population living in Dry Areas	-0.0048 (.0075)	-0.0055 (.0073)	-0.0073 (.0056)	-0.0069 (.0055)	-0.0065 (.0055)	-0.0064 (.0056)
Farm Winery Law in State (1=Yes; 0=No)		0.8763*** (.2299)	0.5039*** (.1269)	0.5359*** (.1275)	0.6734*** (.1609)	0.6789*** (.1616)
State Farm Winery Density			0.0629*** (.0040)	0.0638*** (.0039)	0.0665*** (.0042)	0.0666*** (.0042)
(State Farm Winery Density)^2/1000			-0.1113*** (.0073)	-0.1124*** (.0072)	-0.1173*** (.0076)	-0.1174*** (.0076)
Out-of-State Farm Winery Density			0.0002 (.0002)			
State Mass Production Winery Density			-0.0080 (.0051)	-0.0106*** (.0027)	-0.0118*** (.0028)	-0.0119*** (.0028)
Out-of-State Mass Production Winery Density			0.0017 (.0040)			
Volume of Wine Imports (millions of gallons)			0.0070*** (.0020)	0.0071*** (.0018)	0.0068*** (.0018)	0.0069*** (.0018)
Industry Concentration (4-firm ratio)			0.0464** (.0196)	0.0351*** (.0096)	0.0355*** (.0097)	0.0352*** (.0100)
Farm Winery Law X State Farm Winery Density					-0.00012 (.00009)	-0.00012 (.00009)
Farm Winery Capacity (millions of gallons)						-0.0012 (.0067)
θ (overdispersion parameter)	4.8204*** (.3578)	4.6561*** (.3421)	1.2431*** (.1550)	1.2411*** (.1534)	1.2392*** (.1533)	1.2384*** (.1538)
- Log Likelihood	1996.676	1984.332	1681.994	1682.722	1681.421	1681.41
Δ Likelihood Chi-Squared Ratio (relative to Model 1)		24.688	629.364	627.908	630.51	630.532
Δ Degrees of Freedom (relative to Model 1)		1	8	6	7	8
Number of Cases	2524	2524	2524	2524	2524	2524
Number of Foundings	1711	1711	1711	1711	1711	1711

[a] Standard errors are in parentheses.
* $p < .10$; ** $p < .05$; *** $p < .01$.

Table 3

Multiplier Effects for Niche Formation, Resource Partitioning and Institutional Support

Process	Variable	Multiplier	$Multiplier_{mean}$
Direct Institutional Support	Existence of Farm Winery Law in State	1.709	
Niche Formation	Volume of Wine Imports		1.328
Resource Partitioning	Industry Concentration		1.795
Density Dependence	Number of Farm Wineries in a State		3.346

Table 4

Standardized OLS Regression Models of Farm Winery Foundings: 1941-1990[a]

Independent Variables	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Constant	0.3084*** (.0142)	0.3084*** (.0142)	0.3084*** (.0099)	0.3084*** (.0099)	0.3084*** (.0098)	0.3084*** (.0098)
State Per Capita Annual Personal Income	0.0821*** (.0224)	0.0331 (.0238)	-0.0141 (.0263)	-0.0140 (.0254)	-0.0282 (.0256)	-0.0211 (.0264)
State Per Capita Annual Wine Consumption	0.2015*** (.0222)	0.2124*** (.0221)	0.0447*** (.0166)	0.0447*** (.0165)	0.0505*** (.0165)	0.0498*** (.0165)
% of State Population living in Dry Areas	0.0175 (.0150)	0.0114 (.0923)	-0.0146 (.0109)	-0.0146 (.0109)	-0.0161 (.0108)	-0.0149 (.0109)
Farm Winery Law in State		0.0923*** (.0157)	0.0638*** (.0120)	0.0638*** (.0115)	0.0377*** (.0132)	0.0417*** (.0137)
State Farm Winery Density			1.0203*** (.0347)	1.0204*** (.0345)	0.9607*** (.0376)	0.9652*** (.0378)
(State Farm Winery Density)^2/1000			-0.4693*** (.0261)	-0.4694*** (.0261)	-0.4297*** (.0278)	-0.4310*** (.0279)
Out-of-State Farm Winery Density			0.0003 (.0172)			
State Mass Production Winery Density			-0.1233*** (.0243)	-0.1235*** (.0184)	-0.1008*** (.0192)	-0.1040*** (.0195)
Out-of-State Mass Production Winery Density			0.0004 (.0409)			
Volume of Wine Imports			0.0740*** (.0206)	0.0741*** (.0173)	0.0818*** (.0174)	0.0884*** (.0184)
Industry Concentration			0.0556* (.0346)	0.0550*** (.0159)	0.0562*** (.0159)	0.0478*** (.0176)
Farm Winery Law X State Farm Winery Density					0.0525*** (0.0132)	0.0525*** (.0132)
Farm Winery Capacity						-0.0156 (.0141)
Adjusted R-Square	0.1193	0.1309	0.5775	0.5778	0.5803	0.5803
Number of Cases	2524	2524	2524	2524	2524	2524
Number of Foundings	1711	1711	1711	1711	1711	1711

[a] Standard errors are in parentheses.
* $p < .10$; ** $p < .05$; *** $p < .01$.

Appendix 1

Multiplier Effects for State-level Farm Winery Density[a]

State	$Multiplier_{mean}$	State	$Multiplier_{mean}$
Alabama	1.051	Montana	1.006
Arizona	1.042	Nevada	1.006
Arkansas	2.944	New Hampshire	1.030
California	86.731	New Jersey	1.463
Colorado	1.092	New Mexico	1.433
Connecticut	1.143	New York	4.577
Delaware	1.013	North Carolina	1.280
Florida	1.159	Ohio	5.991
Georgia	1.070	Oklahoma	1.051
Hawaii	1.036	Oregon	2.630
Idaho	1.107	Pennsylvania	1.885
Illinois	1.072	Rhode Island	1.082
Indiana	1.195	South Carolina	1.082
Iowa	1.289	Tennessee	1.084
Kansas	1.004	Texas	1.458
Kentucky	1.059	Utah	1.012
Louisiana	1.190	Vermont	1.022
Maine	1.015	Virginia	1.546
Maryland	1.241	Washington	2.070
Massachusetts	1.073	West Virginia	1.051
Michigan	1.183	Wisconsin	1.245
Minnesota	1.054	Mississippi	1.067
Missouri	1.732		

[a] No farm wineries were located in Alaska, the District of Columbia, Nebraska, North Dakota, South Dakota, and Wyoming during the period of the study.